

REMARKS

Claim 11 has been amended. Claims 1-10 have been canceled solely on the basis that they are directed to a non-elected invention. Thus, claims 11 and 13-22 are pending in the present application. Support for the amendment to claim 11 may be found in the specification at page 29, line 3. Thus, no new matter has been added. Reconsideration and withdrawal of the present rejections in view of the remarks presented herein are respectfully requested.

Rejection under 35 U.S.C. § 102(b)

Claim 11 was rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Maeda et al. (US 5,626,782).

Claim 11 as amended recites that the positive resist composition forms a peak-shaped graph when a size of the formed space pattern is plotted on a graph along a vertical axis, and the preliminary PEB temperature is plotted along a horizontal axis. In contrast, Maeda discloses a positive resist in which the space of the resist pattern is widened with the increase in PEB temperature as illustrated in Figure 16. This figure shows that the space in the finished resist pattern is linearly increased with an increase in the PEB temperature. Thus, in contrast to amended claim 11, a peak-shaped graph is not formed by the positive resist of Maeda et al.

The formation of this peak-shaped graph can be achieved by the use of structural units derived from an acrylate ester, in contrast to the structural units comprising p-t-butyloxycarbonyloxystyrene used by Maeda. Several of the present claims recite structural units (a-1), which are derived from an (α -lower alkyl) acrylate ester that contains an acid dissociable, dissolution inhibiting group and an aliphatic cyclic group; structural units (a-2), which are derived from an (α -lower alkyl) acrylate ester that contains a γ -butyrolactone residue, and structural units (a-3), which are derived from an (α -lower alkyl) acrylate ester that contains a hydroxyl group-containing aliphatic polycyclic hydrocarbon group. Maeda does not disclose such a structure. Accordingly, Maeda discloses nothing that could be used to achieve the claimed relationship when a size of the formed space pattern is plotted on a graph along a vertical axis, and the preliminary PEB temperature is plotted along a horizontal axis.

In view of the comments provided above, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 102(b).

Rejection under 35 U.S.C. §103(a)

Claims 13-22 were rejected under 35 U.S.C. §103(a) as being unpatentable over Maeda (US 5,626,782) in view of Uetani et al. (US 2001/0044070). The Examiner alleges that it would have been obvious to use the chemically amplified positive resist composition of Uetani et al. in the process of forming a resist pattern of Maeda, in order to take advantage of the properties of the chemically amplified positive resist composition of Uetani et al., such as adhesion to a substrate, sensitivity and resolution.” However, as explained below, this combination of references does not render the claimed invention obvious.

As described above, Maeda discloses nothing that could be used to achieve the presently recited peak-shaped graph that is formed when a size of the formed space pattern is plotted on a graph along a vertical axis, and the preliminary PEB temperature is plotted along a horizontal axis. This feature is also not disclosed (or suggested) by Uetani et al. Since Uetani et al. does not remedy the defect in the teaching of Maeda, claims 13-22, which depend either directly or indirectly from claim 11, cannot be *prima facie* obvious.

In addition, even if the claims were *prima facie* obvious in view of these references, the claimed invention provides unexpected results that would effectively rebut any such allegation. Claim 11 as amended recites that the PEB temperature is set to within $\pm 2^{\circ}$ C of the optimum PEB temperature in the lithography process. By conducting patterning using a lithography process at such a PEB temperature, resist pattern is formed which has unexpected, advantageous properties as described in the present specification at page 29, lines 16-18. In particular, this PEB temperature results in a resist pattern that has high levels of sensitivity and resolution, with a uniform resist pattern size within the substrate plane, and with a broad PEB range. The importance of the PEB temperature is also illustrated in the Examples and Comparative provided in the present specification Examples. For example, the specification at page 39 discloses that:

... when the degree of variation in the resist pattern size per unit of temperature at 129°C and 133°C, which represents the limits of the temperature range $131 \pm 2^{\circ}$ C, was determined by dividing the space sizes corresponding with those temperatures $\pm 1^{\circ}$ C by 2° C, the results were 1.4 nm/ $^{\circ}$ C, which represent favorable results. When the PEB margins at 128°C and 134°C were determined in the same manner, the results were 6.9 nm/ $^{\circ}$ C and 5.6 nm/ $^{\circ}$ C, which are unsatisfactorily large (comparative example 4).

Such unexpected results could not have been predicted based on the teachings of Maeda, and would effectively rebut any allegation of *prima facie* obviousness.

Moreover, claims 13-22 also recite an additional feature that results in unexpected, beneficial advantages of the resulting resist pattern. Claim 13 recites a method for forming a resist pattern according to claim 11, wherein the method uses a chemically amplified positive resist composition comprising a copolymer comprising structural units (a-1), (a-2) and (a-3), and in which a glass transition temperature (T_g) of the copolymer is between 100-170°C. Examples 1-5 clearly demonstrate that the degree of variation in the resist pattern size and the level of in-plane uniformity are favorable when the T_g of the copolymer is within the claimed range. In contrast, as illustrated by Comparative Examples 1-3, the degree of variation in the resist pattern size and the level of in-plat uniformity are unsatisfactory when the T_g of the copolymer is higher than 170°C, even though the copolymers have the same structural units as in Examples 1-5. These unexpected, advantageous properties of the resist pattern could not have been predicted based on either Maeda or Uetani et al., either alone or in combination, and are strong evidence of the nonobviousness of the presently claimed invention.

In view of the comments provided above, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a).

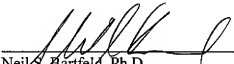
CONCLUSION

Applicants respectfully submit that all claims are in condition for allowance. However, if minor matters remain, the Examiner is invited to contact the undersigned at the telephone number provided below. Please charge any fees, including any fees for extensions of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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